

# Overload Vehicle Resistance System for Bridge

<sup>1</sup>Prajakta M. Patil, <sup>2</sup>Yogita S. Hore, <sup>3</sup>Smitha P. Motagi, <sup>4</sup>Mahesh M. Kamble.

<sup>1,2,3,4</sup>Department of Electrical Engineering, Shivaji University, Sanjay Bhokare Group of Institutes, Miraj/Sangli, 416410, Maharashtra State, India.

**Abstract:** In the recent system the problem of overload in the vehicle transport has emerged. Therefore, how simple and conveniently to know the vehicle load and how to effectively limit overload has become a key issue. In our project integration device can detect conveniently vehicle load to prevent overloading of vehicle and improve vehicle safety and it can effectively reduce heavy work of the vehicle load testing station and improve work efficiency in transport sector. In this paper we are designing simulation using Tinkercad software for simulation. In simulation we used microcontroller for smooth control and quick operation we used pulse width modulation (PWM). We have used solar panel to provide supply to the system to make it eco-friendly.

**Index Terms -** Arduino, TinkerCad simulation, Overload Vehicles, Transport, Pulse width modulation (PWM)

## I. INTRODUCTION

Roads now-a-days play a very important role in every part of world. The value lies in providing safe and convenient travel for the users. One in every three trucks in the country is overloaded and they are to blame for 50 per cent of road accidents. The present works focus on prevention of damage of roads and prevent vehicle damage. It provides safe and convenient travel for the users. As the device is working in the loading process, it is used to prevent vehicle overloading in the process of driving. It ensure the personal safety of driving.

At the same time the system is designed to solve the problem of the damage of highway bridges and it save the national highway maintenance fees and to ensure the safety of people and property. can also travel to provide a more civilized service life for the people and for the country's economic construction contribute a strength.

## II. LITERATURE REVIEW

This paper research provides information about the possibility of vehicle load control system from overload vehicle in transport. Through the pressure sensors installed in vehicle suspension the single chip microprocessor receives the information transmitted by the pressure sensors and calculate the total weight of the vehicle load. Its purpose is to improve vehicle safety and effectively reduce heavy workload of vehicle detection station to improve their work efficiency. [1]

In this paper, we studied overloading prevention system is a useful tool. It has certain preset load. When overloading condition it will give the buzzer sound to alert the driver to control the loading. If it is start moving in overloaded condition, a siren in this vehicle will start to alert checking authority. It could help to reduce the number of overloaded trucks and contribute to the more efficient and effective use of police officer's time. A reduction in overloaded trucks is also conducive to a reduction in crashes. [2]

In this paper, we studied the analysis of pre-stressed highway bridge and its strengthening. The bridge was simply supported  $\Gamma$  Girder structure with four-lanes and it was heavily loaded than its capacity; therefore, bridge was analyzed in flexure using software "SAP 2000" for the actual or modified vehicular loading present over the bridge. [3]

Commercial Vehicle overloading on highways is harmful. It not only increases maintenance expenses but, is also one of the major causes of road accidents. And, over 50% of the commercial vehicles travel regularly on our National/State Highways are overloaded. Although there are legal axle load limit and gross vehicle weight limit of the vehicles plying on roads, they are breaking rule by the transporters. The damage by over-loaded vehicles to pavements is exponential. [4]

The Paper has information about the growth of every nation's economy is estimated by the evolution of its transport substructure. Vehicle overloading is illegal exceeding of maximum allowed weight of vehicles, is a serious problem both in developing and developed countries around the world. This paper basically highlights the work done in determining the problems caused due to overloading in vehicles and the technologies used for monitoring, detecting and controlling overload in the vehicles. [5]

We have studied all this literature which helped us to design our project.

## III. BLOCK DIAGRAM AND PROGRAM EXECUTION

### 3.1 Block Diagram:

Fig 1 shows the block diagram of the operation of the Overload vehicle resistance for bridge system. In this design we used ATmega328P microcontroller. In input section commanding sensor is placed for give command to motor through microcontroller. As input sensor we placed push to on switch for giving signal to the microcontroller. In output section one motor is connected. The motor is used as overload barrier motor to close entry on the bridge. The motor is connected through motor drivers. LCD display section is given us visual output what machine sense. In block diagram Solar panel section and charging unit is for providing power to whole system.

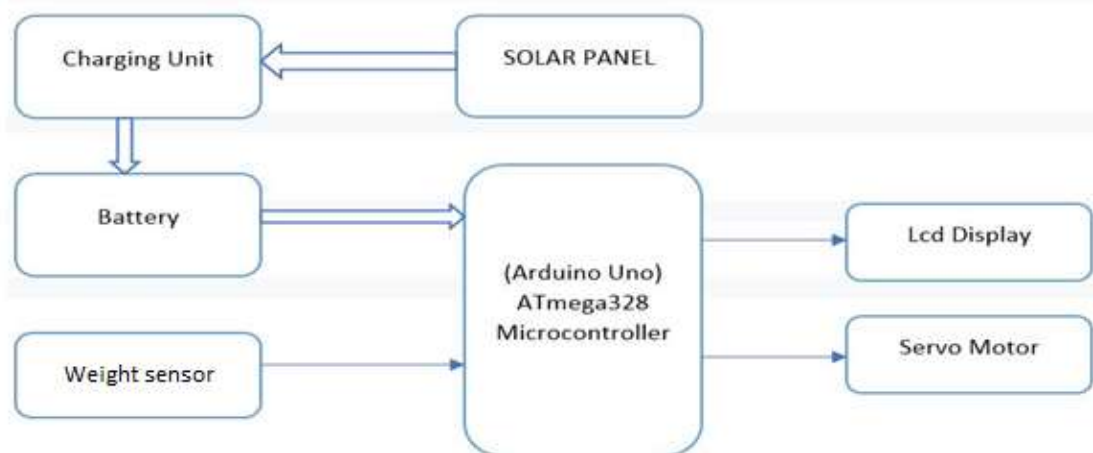


Fig.1 Block Diagram

**3.2 Program Execution:**

Fig 2 shows a flowchart of the simulation operation of the Overload vehicle resistance system for bridge. In practice, a weight sensor (Button) is placed on road to sense the weight. In the microcontroller, we have set the value of weight. So, if the weight is increased as compared to our set value, then it is sensed by the weight sensor. When overloaded vehicle passes over with sensor. Sensor sense the weight and compare with set value if value is higher than set value and microcontroller receives input from the weight sensor and gives signal output to the servo motor to rotates at a 90-degree angle. Here a barrier for the overloaded vehicles and it is connected to that servo motor. So due to servo motor 90-degree angle rotation, the entry on the bridge is closed by that bridge barrier and it is displayed on LCD by Text of “Stop u overload”. Then system check continuously the weight sensor input value and perform according to that input. According to that if the vehicle is underweighted , then no overloading condition consider by the weight sensor and hence system allows the entry of vehicles on the bridge and it is displayed on LCD Display by “ok go” text.

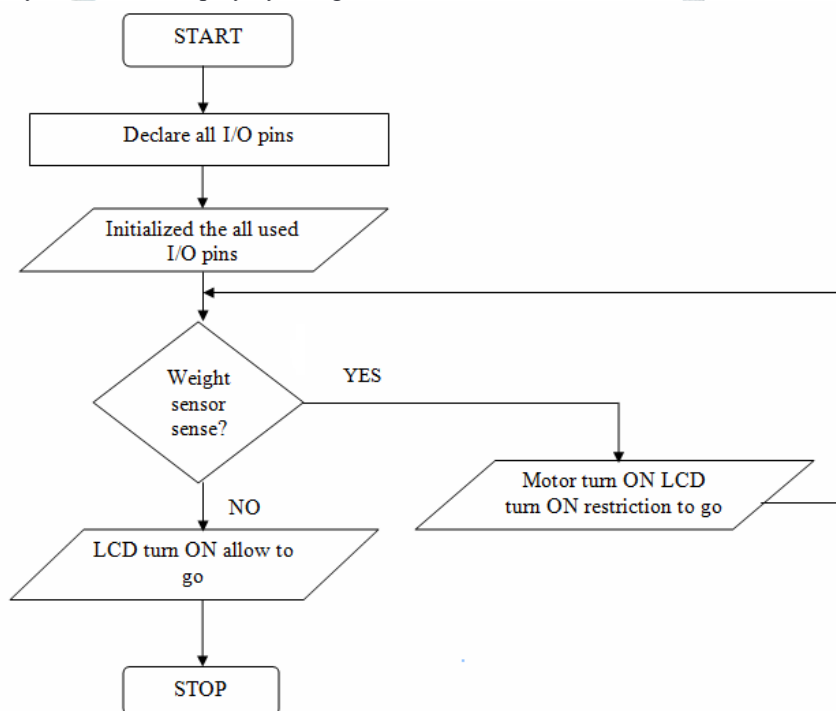


Fig.2 Flow chart of simulation

**IV. SIMULATION DESIGN**

In this simulation design, For control unit we used ATmega328P microcontroller. These microcontrollers are familiar of Atmel 8-bit AVR microcontroller. In this microcontroller 14 digital I/O pins, 6 analog pins which is also use I/O pins, 2 UART pins are present. In this simulation we used 10 pins for perform action. Pin 2, 3, 4, 5, 11, 12 are connected with 16x2 LCD display. Pin 9 connected to weight sensor pin 10 is connected to motor. In the control unit motors are controlled by PWM method . When any command from weight sensor (button) given to microcontroller get output to motor driver IC input pins as high low pulses when command will apply then motor shaft will have to move as specific angle which is 90degree to obey restriction action.

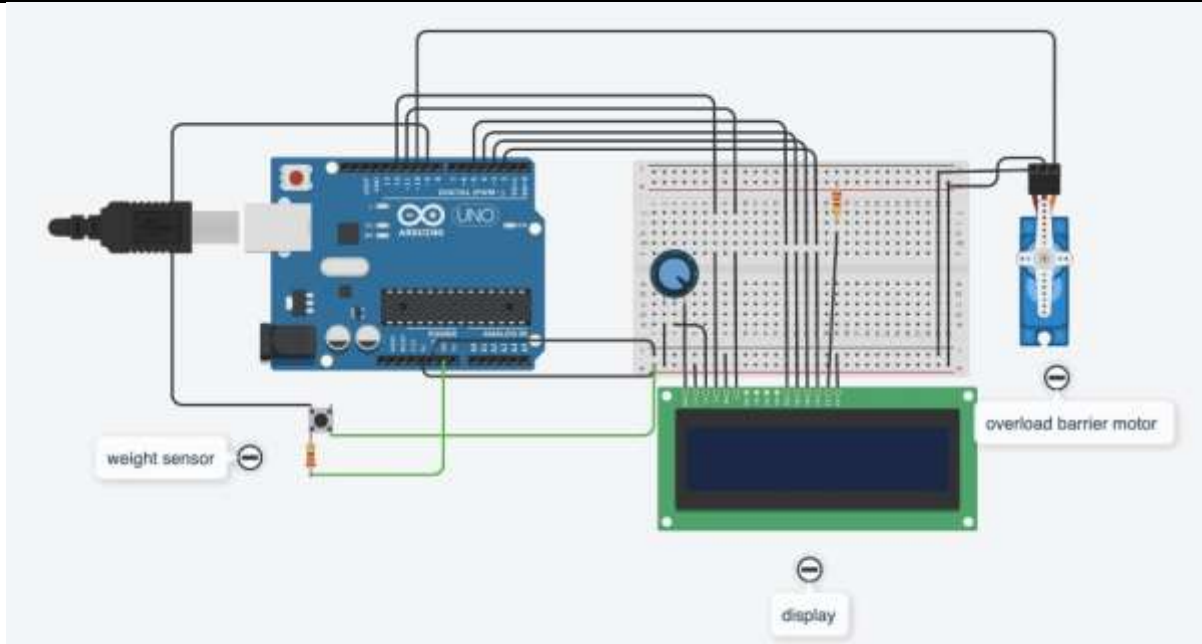


Fig.3 Simulation design of Overload vehicle resistance system for bridge

## V. RESULTS AND DISCUSSION

### 5.1 Case 1: No Overloading Condition:

In Case1: In this case, we have used Switch as an input of sensor, which is connected to pin 9 of the Arduino. when the vehicles weight is within set value are passes over the switch then weight sensor send the input to the pin 9. Then the microcontroller send output signal to motor driver and LCD. The servo motor will remain in original position and the LCD displays “ok go” and allows vehicles to pass the bridge.

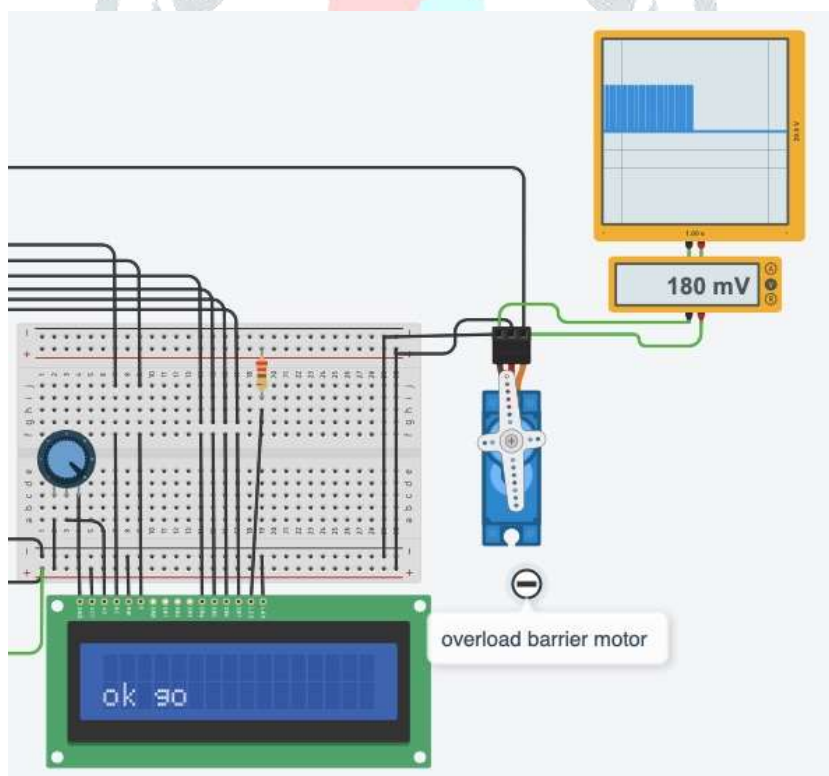


Figure 4. Simulation operation result at “No overloading condition”

### 5.2 Case2: Overloading Condition:

In Case 2: In this section in this simulation we put switch as sensors. Assume this condition. We use pin number 9 of microcontroller for perform this action as input. when any vehicle is passes from this section where we these weight sensors are placed on road. It will sense the weight of vehicle and gives these input values to the microcontroller. Microcontroller will compare these values with set value. The input value is greater than set value then microcontroller give high pulse to output section. In output section we used pin 10 of microcontroller as output pin and is connected to weight barrier motor driver module and LCD are connected. In motor driver it gives open

path to the supply to motor to run so as to rotate in a 90degree angle and restrict the vehicle. At display section it will display “stop u overload”

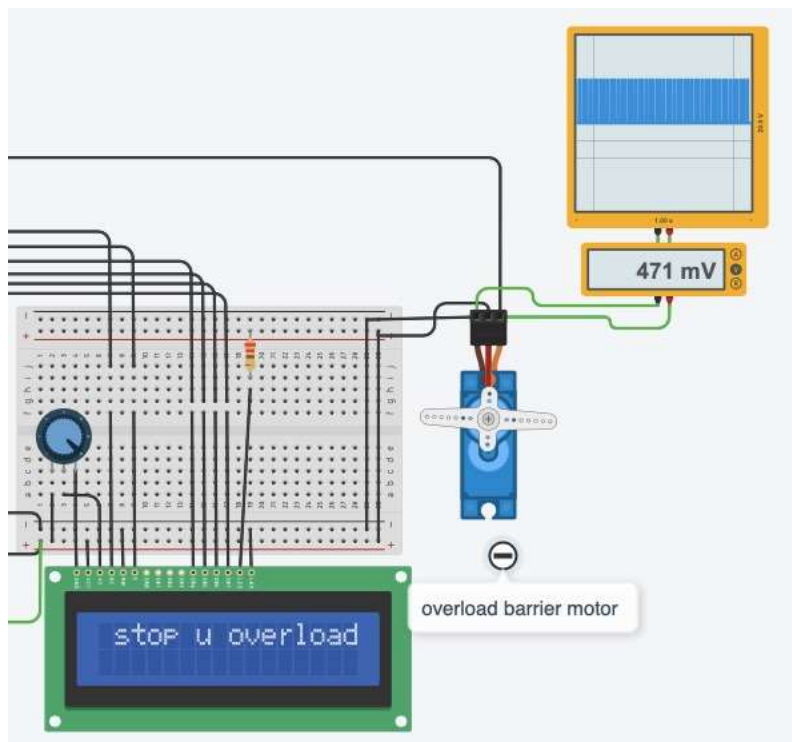


Figure 5. Simulation operation result at “Overloading condition”

5.3 Result Table:

Table 5.3: Simulation Result for Overloading condition and No overloading condition

Case No	Case	Action		
		LCD	Servo motor	
Case1	No Condition	Overloading	Ok go	Servo motor is in original angle
Case 2	Overloading Condition		Stop u overload	Servo motor rotated in 90-degree angle position

VI. CONCLUSION

In this project, we have designed the Simulation design of the “Overload vehicle resistance system for bridge”.Overloading prevention system is a useful tool to contribute towards more compliance with mass regulation. It could help to reduce the number of overload vehicles and contribute to the more efficient and effective use of Bridges and reduces crashes and serious damage to people’s lives and property. Therefore this system is simple and convenient to know the vehicle load and solve the problem of vehicle overloading effectively and increases the lifespan of bridge and roads.

VII. ACKNOWLEDGMENT

We are pleased to bring you the “Overload vehicle resistance system for bridge” We are thankful to our project guide, Prof. M. M. Kamble sir, Principal Prof. (Dr.) A.C. Bhagali, sir, our HOD, Mr. D.S. Bhangari sir, and we take this opportunity to thank all those who supported us for this project. We have used various research papers and books as a reference, so thank you to all the authors in it.

REFERENCES

[1] Jun Li1, Yanzhao Su1, Jinli xie1, Yangjiao Xu1 & Lei Ji1,2. Research of the vehicle load control system integration device. Studies in Engineering and Technology Vol.1,No.2;August 2014.

[2] Mohamed Rehan Karim1, Ahmad Saifizul Abdullah1, Hideo Yamanaka2, Airul Sharizli Abdullah1, Rahizar Ramli1 Degree of Vehicle Overloading and its Impication on Road Safety in Developing Counties. Apr 2013.

[3] Sadaqat Ullah Khan, Tehmina Ayubb, AdnanQadira. Effect of overloaded vehicles on the performance of highway bridge girder.2014:A case study How Payload works by john fulle R auto vehicle towing capacity.

- [4] Swapan Kumar bagui, Atasi Das, Chirinjeevi Bapanapalli .Controlling Vehicle Overloading in BOT Projects. December 2013
- [5] Anusha Gaira, Alim Parveen, Drishti Dabral, Jayshree Goyal, Rekha Rani. Vehice Overloading: A review.IJRASET. Vol.8.Issue VII july 2020.

